FACTORS INFLUENCING THE SCHOOL
SUCCESS OF THE BLIND

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HOUSE FOR THE BLIND

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These facts have been brought out as the result of an investigation recently completed by the National Industrial Conference Board, which has 34 affiliated industrial organizations. This investigation was carried through by an advisory joint conference committee, consisting of representatives of the board and of the Society for the Promotion of Engineering Education. The findings are presented in special report number 25 of the board.

"Our investigation has developed the fact," writes the managing director Mr. Magnus W. Alexander, "that industry may need about 400,000 more men for positions of responsibility by 1930 than were employed in 1920, not counting replacements. To meet this demand of approximately 40,000 annually, the engineering colleges are only graduating men at the rate of 9,000 per year, a large percentage of whom will at first or eventually select work other than in industry. Obviously, the problem of the proper selection, education and training of a sufficient supply of young men capable of filling positions of technical and administrative responsibility is a great one, requiring the attention of every progressive educator and industrialist."

Mr. Alexander is addressing a letter to presidents of technical schools and colleges urging activity in obtaining engineering students to meet the present and future demands of industry.

The following is a summary of points made in special report number 25 of the National Industrial Conference Board:

"Every industrial corporation of any considerable size must have a well-thought-out educational policy." An adequate policy involves two main lines of procedure; first, educational practice within the industry, and, second, cooperation with educators.

1. *Educational Practice within the Industry.*
   (a) More and better training courses in industrial establishments.
   (b) More effective use of correspondence and extension courses and night schools.
2. *Cooperation of Industry with Educators.*
   This involves, on the part of industrialists:
   (a) Coordination of effort of industrialists and educators.
   (b) Accurate understanding of what may be reasonably expected of the engineering schools in the discovery and development of engineering and administrative talent.
   (c) Personal interest in neighboring engineering schools.
   (d) Provision of opportunities for practical training of instructors of engineering schools.
   (e) Assistance in locating and securing competent instructors for schools.
   (f) Measures which will increase the esteem in which educators are held and increase the inducement of the teaching profession to the men who have the teaching instinct.
   (g) Assistance in formulating tests for fitness, intelligence and character, as a basis for admission to engineering schools.
   (h) Proper coordination of practical training courses with engineering courses of neighboring schools.
   (i) Assistance in enlightening preparatory schools regarding the value of engineering and science courses; also influencing preparatory schools to employ adequate intelligence tests to prove which boys have "science minds" and to direct towards engineering and science courses all who have such characteristics.

As a concomitant of such operation by industrialists, they in turn should look for cooperation from educators in the following ways:

(a) Assistance in locating and securing men with teaching instincts who may help in the educational work of the industrial establishment.
(b) Assistance in development of tests for fitness, intelligence and character of recruits for industry.
(c) Assistance in development of training courses for instructors and students and in the development of general educational policy and procedure.

EDUCATIONAL RESEARCH AND STATISTICS

FACTORS INFLUENCING THE SCHOOL SUCCESS OF THE BLIND

IN a recent article[1] Allen calls attention to

[1] "Special features in the education of the blind during the biennium 1918–1920," Bureau of Education Bulletin No. 16, 1921.

the most notable events affecting the status of the blind during the biennium 1918–1920, mentioning, among other things, the direction of the attention of society to the needs of the handicapped; the labor shortage which created many and new openings for their employment; and the federal law providing, under certain conditions, for the rehabilitation of people injured in industry and otherwise. In addition, he invites attention to certain arresting events in the special field of the blind, such as the final adoption of Braille as the uniform type to be used, and along with this the fivefold increase in the government subsidy to the American Printing House for the Blind; the successful growth of the new movement for teaching partially seeing children by themselves; the widening interest in psychological research among blinded school pupils; and finally, the successful teacher-training work for teachers and workers among the blind and semi-sighted.

Although the work of Hayes has been more than pioneer in the mental measurement of the blind, little serious attention has been given to making detailed and intensive studies of the psycho-pedagogical aspects involved in teaching the blind. The present article[2] endeavors to present some detailed and exact data regarding the factors influencing the school success of the blind and to contribute somewhat to the special pedagogy of the teachers working in the field.

Five factors possibly affecting school progress (other than that of general intelligence) are investigated in detail. They are: (1) Cause of blindness, (2) degree of blindness, (3) age at which blindness occurred, (4) sex, (5) age at entrance to school of those who were blind from birth or early infancy. The problem is attacked from two angles: (1) The consideration of marks on a percentage basis as assigned by teachers, and (2) the use of intelligence quotients determined by individual intelligence examinations.

MATERIAL FOR THE STUDY

Two hundred and forty students in the New York State School for the Blind, Batavia, New York, are included in the study. These 240 were selected from 344 on record, those not included being rejected because they had not been in school at least two years. The period of two years is selected arbitrarily as a fair minimum because (1) of the rather long period of adjustment required by sightless pupils in getting acquainted with the school and its organization, and (2) if a pupil does not remain in school for at least a two-year period (the cause of withdrawal generally being too much sight to warrant retention in a school for the blind, too low mentality, poor health, inability to adjust to school routine, parental desire, etc.), the withdrawing students contribute nothing very material to the problem in hand and can be omitted without affecting the practical outcome of the study.

TABLE I—SAMPLE RATING CARD

Year Ending	1910	'11	'12	'13	'14	'15	'16	'17	'18	'19	Arithmetical Mean
Reading	78	88	94	96	90	.....	.....	.....	.....	.....	89
Writing	.....	76	88	90	.....	.....	.....	.....	.....	.....	85
Spelling	82	91	95	95	97	92	.....	.....	.....	.....	92
Arithmetic	97	90	90	91	83	82	77	.....	.....	.....	87
Geography	.....	.....	93	89	90	89	.....	.....	.....	.....	90
El. English	.....	.....	93	92	89	85	.....	.....	.....	.....	90
Physiology	.....	.....	93	.....	.....	.....	.....	60	79	.....	77
U. S. History	.....	.....	.....	.....	91	90	.....	.....	.....	.....	91
Biology	.....	.....	.....	.....	.....	.....	.....	42	68	.....	55
Phy. Geography	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Algebra	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Geometry	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
English	.....	.....	.....	.....	.....	.....	.....	84	86	87	85
German	.....	.....	.....	.....	.....	.....	71	.....	87	77	78
Latin	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
History	.....	.....	.....	.....	.....	.....	79	.....	.....	93	86

[2] The data incorporated in the article were gathered by D. L. Hint, head academic teacher in the New York State School for the Blind, in the preparation of his thesis for the Master of Arts degree. Mr. Hint and the writer concur in the interpretation of the data.

Of the 240 pupils, 100 were girls and 140 were boys. Students entering the school as early as 1907 are included, but intelligence tests for these naturally were not available. The investigation was narrowed still further by leaving out of consideration all marks in music, piano tuning, industrial, gymnastics and typewriting classes, retaining for discussion herein the typical academic subjects of the elementary and secondary school. As a satisfactory working basis for handling the numerous class marks, the arithmetical mean of the marks given at the end of the four quarters of the school year is employed. As a further condensation the mean of the ratings for all the years that a pupil studied a given subject was found; finally the arithmetical mean of all marks in all these subjects for all the time a pupil was in school. This final measure is used as a representative rating of a pupil's success throughout all his elementary and high school work. Individual records were transcribed upon separate cards, Table I being typical, this particular pupil having a mean rating of 84.

The intelligence quotients employed were secured by Miss Edith Taylor, a carefully trained tester, using the Stanford-Binet Scale, modified for use with the blind by Dr. Samuel P. Hayes.

CAUSE OF BLINDNESS

Teachers of the blind invariably seek to learn the cause of the blindness of a new pupil, the impression having gained ground that there is some relation between the cause of blindness and school success. A detailed tabulation of the causes for the loss of sight of the 240 pupils was made from the examination blanks of the school's ophthalmic examiner (see Table II).

It is evident that 53 per cent. of the cases is due to the first three causes, the remaining 47 per cent. being scattered through a list of 31 causes. Five groups are considered significant for the purposes of the present study—1, 2, 3, 6,

TABLE II—CAUSES OF BLINDNESS

Cause	Boys	Girls	Total	Per cent. of total
(1) Ophthalmia neonatorum	31	28	59	24.6
(2) Optic atrophy	19	16	35	14.6
(3) Congenital cataract	18	15	33	13.8
(4) Hydrophthalmus	12	2	14	
(5) Sympathetic ophthalmia	5	4	9	
(6) Congenital amblyopia	9	9	18	
(7) Traumatism and sym. ophthalmia	6	.....	6	
(8) Choroiditis	5	1	6	
(9) Microphthalmus	4	1	5	
(10) Irido-cyclitis	3	3	6	
(11) Progressive myopia	1	1	2	
(12) Interstitial keratitis	3	4	7	
(13) Retinitis pigmentosa	.....	3	3	
(14) Conical cornea	1	1	2	
(15) Detached retina	5	.....	5	
(16) Chorido-retinitis	1	1	2	
(17) Lamellar cataract	1	.....	1	
(18) Phylotenular keratitis	1	.....	1	
(19) Corneal ulcers	2	.....	2	
(20) Zonular cataract	1	1	2	
(21) Keratitis	2	2	4	
(22) Traumatism	1	.....	1	
(23) Trachoma	1	.....	1	
(24) Retinitis	1	1	2	
(25) Congenital malformation	1	.....	1	
(26) Anterior polar cataract	1	1	2	
(27) Traumatic cataract	1	.....	1	
(28) Neuro-retinitis	.....	1	1	
(29) Uveitis	.....	1	1	
(30) Purulent conjunctivitis	.....	1	1	
(31) Ulcerative keratitis	.....	1	1	
(32) Iritis	.....	1	1	
(33) Cataract	.....	1	1	
(34) Uncertain	4	.....	4	
	140	100	240	

and a combination of the accidental (5, 7, 22, and 27).[3]

A study of the arithmetical mean of the teachers' marks obtained in each subject by pupils making up the five groups warrants rather definite conclusions that the cause of blindness is closely related to school progress. The following statements are justified: (1) Pupils who lost their sight through accident may be expected to do the best work; (2) optic atrophy cases come next in order; (3) ophthalmia neonatorum cases are third highest for the boys, with the girls practically equal to those of the congenital cases; and (4) congenitally blind of both sexes do the least satisfactory school work.

DEGREE OF BLINDNESS

Students in a school for the blind are classified for their degree of blindness as (1) total, (2) light perception, (3) ability to count fingers at various distances and (4) ability to read the Snellen test cards. The classification of the 240 cases concerned in this study is reported in Table III.

TABLE III—CLASSIFICATION ACCORDING TO DEGREE OF BLINDNESS

Degree	Boys		Girls		Total	
	No.	%	No.	%	No.	%
Total	41	29.3	28	28	69	28.7
Light per.	37	26.4	28	28	65	27.1
Fingers	41	29.3	33	33	74	30.8
Snellen	21	15	11	11	32	13.4

So far as practical educational value is concerned, total blindness and light perception may be safely classed together as being valueless. The third class can barely distinguish heavily lined maps and simple diagrams. The fourth group can read large clear-cut print and study maps and drawings under favorable light conditions.

When arithmetical means are determined both for boys and girls and classified according to degree of blindness (see Table IV), three conclusions may be drawn: (1) those totally blind and those with light perception do the best work if boys, and next to the best if girls; (2) those classed as having ability to count fingers do the least satisfactory work for both sexes; and (3) those tested by the Snellen cards, if boys, will do work equal to that of the first two groups, while the rating for girls will be materially higher than those with no sight or only light perception.

TABLE IV—ARITHMETICAL MEANS OF STUDENTS' MARKS

	Total	Light Per.	Fingers	Snellen
Boys				
El. subjects	83	84.2	81.2	83.3
High school	83.9	84.1	79.8	82.7
Total	83.4	84.2	80.5	83
Girls				
El. subjects	79.7	80.4	81.3	83.3
High school	83.7	82.6	77.9	83.5
Total	81.7	81.5	79.6	83.4

In reference to the three conclusions, it may be pointed out that students totally blind or merely having light perception are not tempted to rely on any visual powers and hence concentrate upon touch; that the possession of sufficient sight to count fingers renders the student unwilling to rely on touch even though he can not do well with vision, hence resulting in a bad dissipation of effort and attention; that the conflicting results for the sexes in the last group is due probably to the fact that the psychology of the job has succeeded in pulling out of school (especially the high school) all but the poorer male students, while the girls of this group are still in attendance.

AGE AT INCIDENCE

In studying the factor of age at incidence, the following ages are chosen, herein making a sixfold classification: Group I, from birth to 23 months; II, from 2 to 5 years; III, from 6 to 10 years; IV, from 11 to 15 years; V, from 16 to 20 years; and VI, 21 and above. These divisions are arbitrarily made and have justification only for statistical practicability, with the possible exception of Group I, where there is some psychological justification in grouping together all children blinded before reaching two years of age.

When arithmetical means for both sexes in the various subjects are determined, Table V is derived. The results indicate that those in

[3] *Ophthalmia neonatorum* is probably due in most cases to infections at or very shortly after birth. *Optic atrophy* produces blindness through inflammation and deterioration of the optic nerve. *Congenital amblyopia* is a loose term to cover cases where the exact cause of the congenital blindness can not be definitely ascertained. The combination group is due to accidental injuries to the eye by gunshot, arrow, scissors, knives, etc.

TABLE V—ARITHMETICAL MEAN OF TEACHERS' MARKS ARRANGED ACCORDING TO AGE AT INCIDENCE

	I	II	III	IV	V	VI
Age	B-23	2-5	6-10	11-15	16-20	21-
Boys						
El. sub....	82.5	84.3	84.5	86.6	86.9	
H. S. sub.	81.6	88.7	83.5	86.6	85.6	
Total	82	86.5	84	86.6	86.3	
Girls						
El. sub....	80.6	81.6	87.4	80.1	87.8	86.9
H. S. sub.	81.1	87.9	77.7	.....	86.8	.....
Total	80.9	84.7	80.7	80.1	87.3	86.9

Group I have a rating approximately equal to the arithmetical mean of the ratings of the first four groups discussed under "cause of blindness," the ratings of the remaining five more nearly approaching those of the fifth or accidental group. In general, the statistics show that early incidence correlates with low school success and that teachers' marks will be materially better for students not losing sight before the age of two years. Probably the causes responsible for congenital blindness cause a wide disarrangement within the nervous system, this tending to make school progress relatively difficult; also, those blinded after infancy have a mass of visual memories very advantageous in school work.

AGE AT ENTRANCE

In many cases beginning the education of blind children is often postponed beyond the customary age of six years. Teachers of the blind generally hold to the opinion that the problem of learning to read is much harder for the more mature pupils and that, if sightless children were sent to school when quite young, the entire teaching problem would be rendered easier and better results secured. To answer these questions, a statistical treatment is made upon four three-year periods of entrance, including only those pupils blind before the age of two years. In Group I are those who entered at the ages 4, 5 and 6; Group II at 7, 8 and 9; Group III at 10, 11 and 12; and Group IV at 13, 14 and 15. Means of achievement in the school subjects are shown in Table VI. These results, based on the elementary and high school subjects, show that, of those blinded before the age of two years, boys entering at ages 10–12 do the best work, girls at 13–15, while for both sexes those entering at 4–6 do the lowest grade. Comparable results follow for the specific instructional field of reading, early entrants securing least satisfactory marks throughout their school course. It may be concluded, therefore, that (1) entrance before the age of 7 is of no advantage from the standpoint of school success and (2) late entrance does not necessarily result in low grade attainments.

TABLE VI—ARITHMETICAL MEANS ACCORDING TO AGE AT ENTRANCE

Age	4,5,6	7,8,9	10,11,12	13,14,15
Boys				
El. sub.	79.4	82.4	85.3	84.7
H. S. sub.....	80.1	78.7	84.9	81.8
Total	79.7	80.5	85.1	83.3
Girls				
El. sub.	71.4	82.6	80.3	81.3
H. S. sub.....	.....	80.9	77.8	83.9
Total	74.1	81.8	79.2	82.6
Reading				
Boys	73.8	79.1	82.1	82.4
Girls	66.4	81.4	81.5	79.6

SEX DIFFERENCES

Since sex records are kept distinct throughout this study, these are now easily brought together in Table VII. With only three exceptions the arithmetical means of the teachers' marks for the boys are higher than those for the girls. Although this condition is contrary to that usually found in public schools, it should not be interpreted to mean that sightless pupils, from the educational standpoint, are essentially different from those in public schools. Several factors

TABLE VII—SUMMARY OF SEX DIFFERENCES

Cause	O. N.	Optic At.	Cong. Cat.	Cong. Amb.	Acc.
Boys	82.6	83.8	81.1	81.7	87.2
Girls	79.5	81.8	79.9	80.4	83.6

Degree	Total	Light Per.	Fingers	Snellen
Boys	83.4	84.2	80.5	83
Girls	81.7	81.5	79.6	83.4

Age at Incid.	B-23	2-5	6-10	11-15	16-20	21-
Boys	82	86.5	84	86.6	86.3	.....
Girls	80.9	84.7	80.7	80.1	87.3	86.9

Age at Entrance	4,5,6	7,8,9	10,11,12	13,14,15
Boys	79.7	80.5	85.1	83.3
Girls	74.1	81.8	79.2	82.6

probably contribute to the situation. The course of study may be more attractive to the boys or the methods of instruction more suited to them. Perhaps the girls devote relatively too much time and energy to the musical, industrial and gymnastics phases of school work, or study conditions are in the boys' favor. Probably all these are operating to condition the obvious results, namely, the boys under consideration may be expected to do a materially higher grade of work than the girls.

I. Q's and Correlation

Intelligence quotients of the students distribute as follows:

I. Q.	No. of Pupils	I. Q.	No. of Pupils
Above 120	8	80–90	19
110–119	17	70–79	9
100–109	58	60–69	5
90–99	32	50–59	1

The distribution shows more quotients below 80 per cent. than is to be expected in public schools, thus emphasizing the fact that elimination because of low grade intelligence is not as rapid or as sure in the institution as in the public schools.

In an effort to evaluate the reliability of the teachers' marks employed throughout the investigation, three correlations are made, these being shown in Table VIII.

Table VIII—Correlations between I. Q's, Teachers' Marks and Estimates

	Boys	Girls
I. Q. with teachers' estimate	.69 ± .036	.78 ± .031
I. Q. with teachers' marks	.42 ± .058	.16 ± .08
Teachers' marks with estimates	.504 ± .017	.43 ± .071

The correlations are positive and, in general, significant and reliable. Two factors contribute to the unusually high correlation between teachers' estimates (following Terman's fivefold classification) and intelligence quotients. First, the teachers' estimates used are obtained by taking the median of the vote of all teachers and matrons in the school. Second, the fact that the pupils live in the school gives teachers a better chance than is ordinarily afforded to estimate the pupil ability.

No satisfactory discussion can now be given for the very low correlation between teachers' marks and the intelligence quotients of the girls. Several factors may contribute to it, such as the fact that most of the teachers in the institution are women, the course of study may be better adapted to boys, the intelligence test used may not be equally satisfactory for both sexes, etc.

Conclusions

The statistical treatment of teachers' marks as a measure of school success in elementary and high school subjects of 140 boys and 100 girls who had been in the New York State School for the Blind for a period of at least two years warrants the drawing of the following conclusions regarding factors conditioning school progress:

(1) Cause of blindness. The lowest grade of work is done by the congenitally blind, the highest by those blinded accidentally.

(2) Degree of blindness. Ability to count fingers at various distances results in the poorest school work, probably because of the unavoidable lack of concentration, the three remaining classes doing practically the same quality of work.

(3) Age at incidence. Incidence before two years results in unsatisfactory work, the possession of visual memories being of material advantage to pupils losing their sight later in life.

(4) Age at entrance. Entering school before the age of 7 is of no advantage so far as school success is concerned, and late entrance does not prevent good school work.

(5) Sex. Sex differences are small and insignificant, the boys surpassing the girls quite uniformly.

(6) Correlations. Correlations between teachers' marks, teachers' estimates and intelligence quotients are high and easily interpreted, with the exception that a fairly low correlation is secured between teachers' marks and the intelligence quotients of the girls. This fact may detract from the value of certain conclusions based on the girls' marks. In any event, it raises problems for future study.

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